



FDNY

13,500 Fire & EMS Workers

Proudly Serving New York and the USA

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SOUTH TOWER & NORTH TOWER COLLAPSE DURING RESCUE EFFORT



**2 TOWERS
~110 STORIES
& SEVERAL
OTHER BLDS.
BECAME
~3 STORIES OF
PULVERIZED
RUBBLE**



A background image showing several FDNY firefighters in full gear, including helmets and reflective stripes, standing in a debris field. The scene is hazy, suggesting the aftermath of a major disaster. One firefighter in the foreground on the right is looking directly at the camera.

343 FDNY FATALITIES

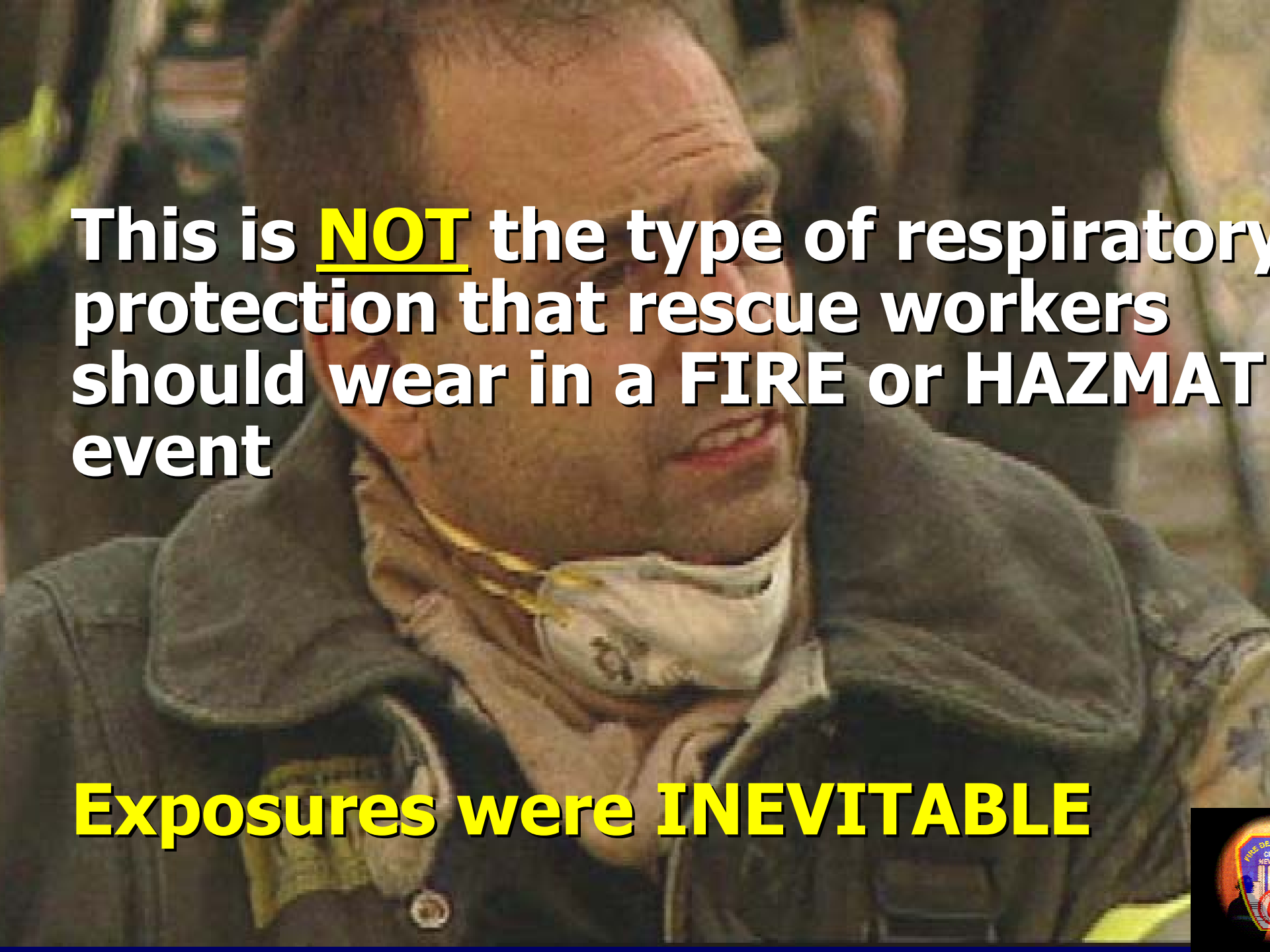
13,000 FDNY SURVIVORS

**1636+, Arriving At WTC
During The AM Of The Collapse**

**6958+, Arriving At WTC
Over The Next 48 Hours**

1320+, Arriving At WTC The Next Week

A Few Hundred Arriving Thereafter

A close-up photograph of a firefighter. He is wearing a dark, heavy-duty jacket with a light-colored hood. A white respirator mask is hanging around his neck, not covering his face. He has a serious expression and is looking downwards. The background is blurred, showing other people in similar gear.

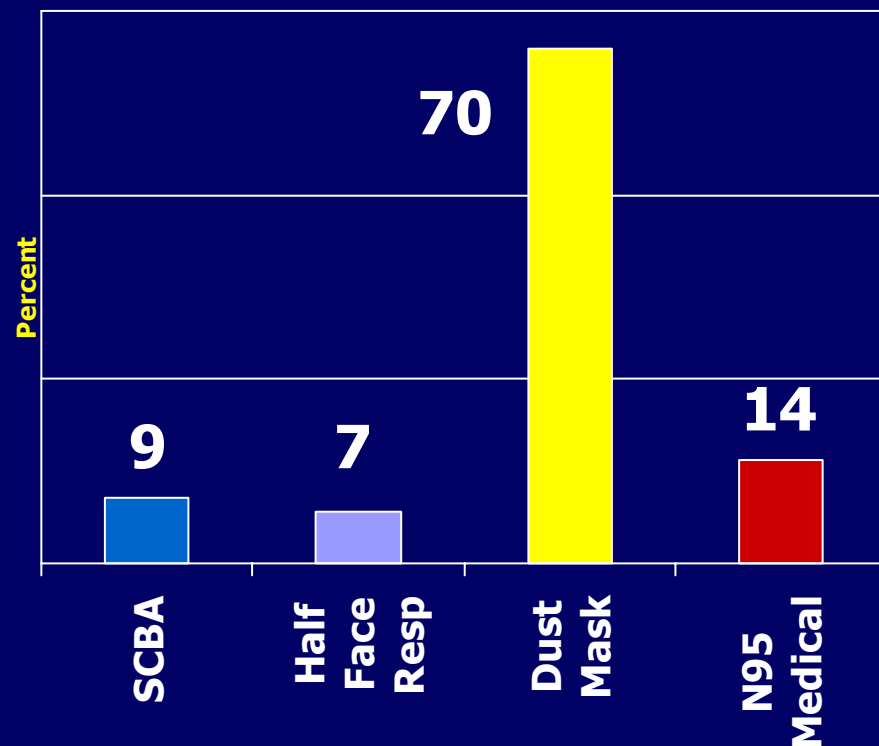
This is **NOT** the type of respiratory protection that rescue workers should wear in a FIRE or HAZMAT event

Exposures were INEVITABLE



On day 1 when working, mask type worn & frequency

For many reasons, few (7 %) had the proper mask for this type of exposure and work activity

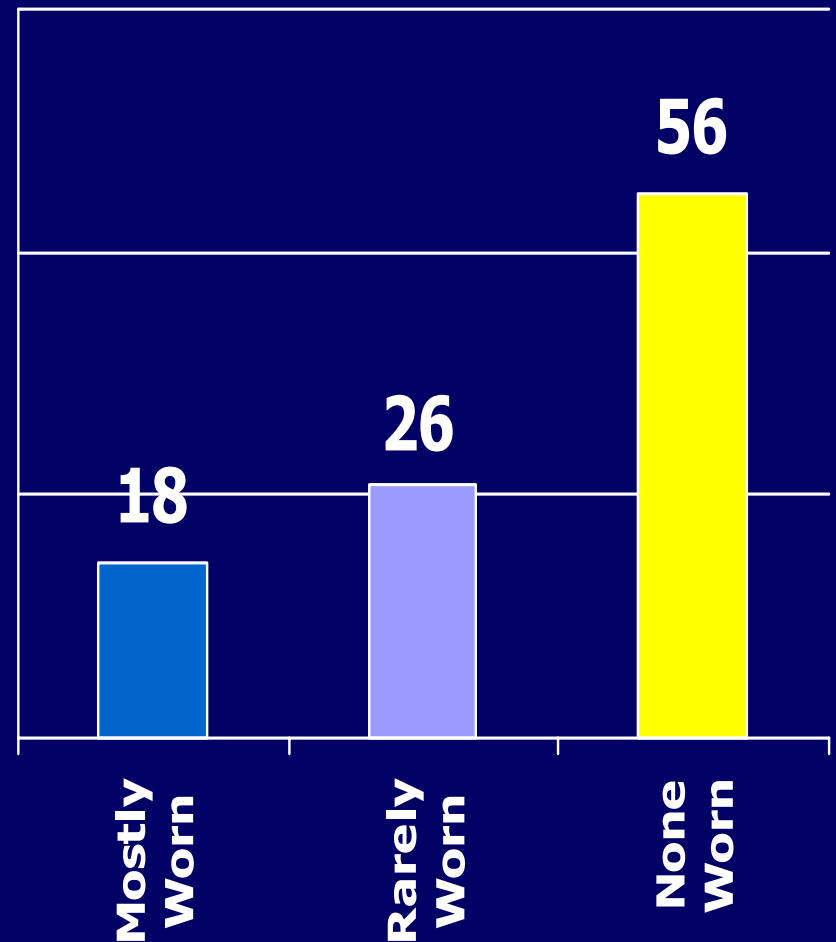


MMWR Sept 2002

On DAY 1 when working, mask type worn & frequency

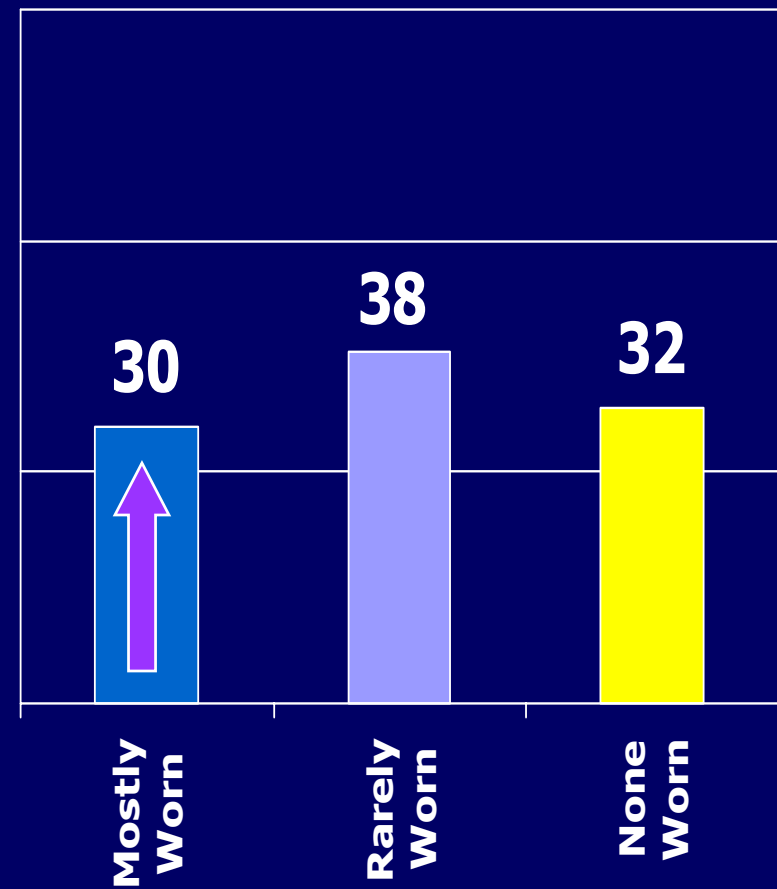
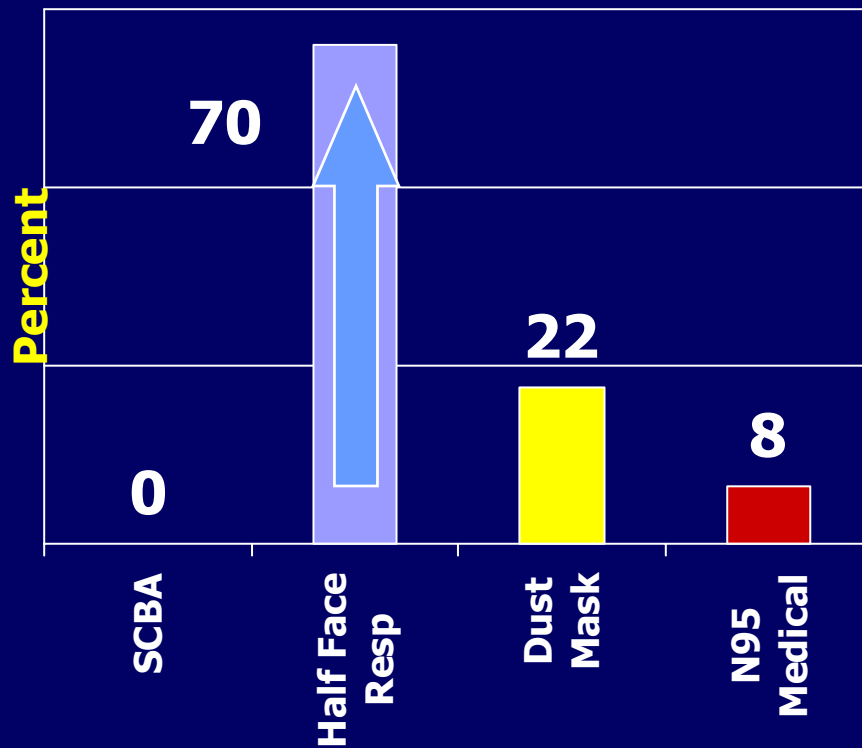
Only 18% report wearing any type of mask on Day 1.

MMWR Sept 2002



On wk 2 when working, mask type worn & frequency

MMWR Sept 200



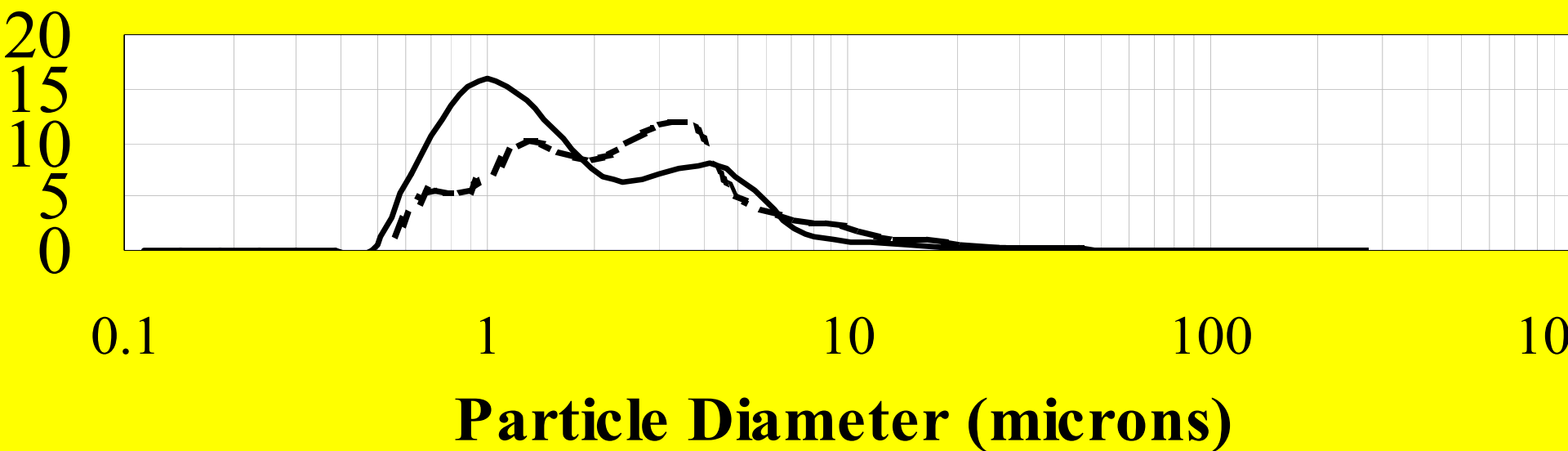
WTC DUST = Particulate Matter

The Major Toxin is Dust:

- **PULVERIZED CONCRETE**
- **FIBROUS GLASS & SILICATES**
- **CARBON PARTICULATES**
- **ASBESTOS**
- **ALKALINE pH**

Particle Size Distributions Induced Sputum & Settled WTC Aerosol

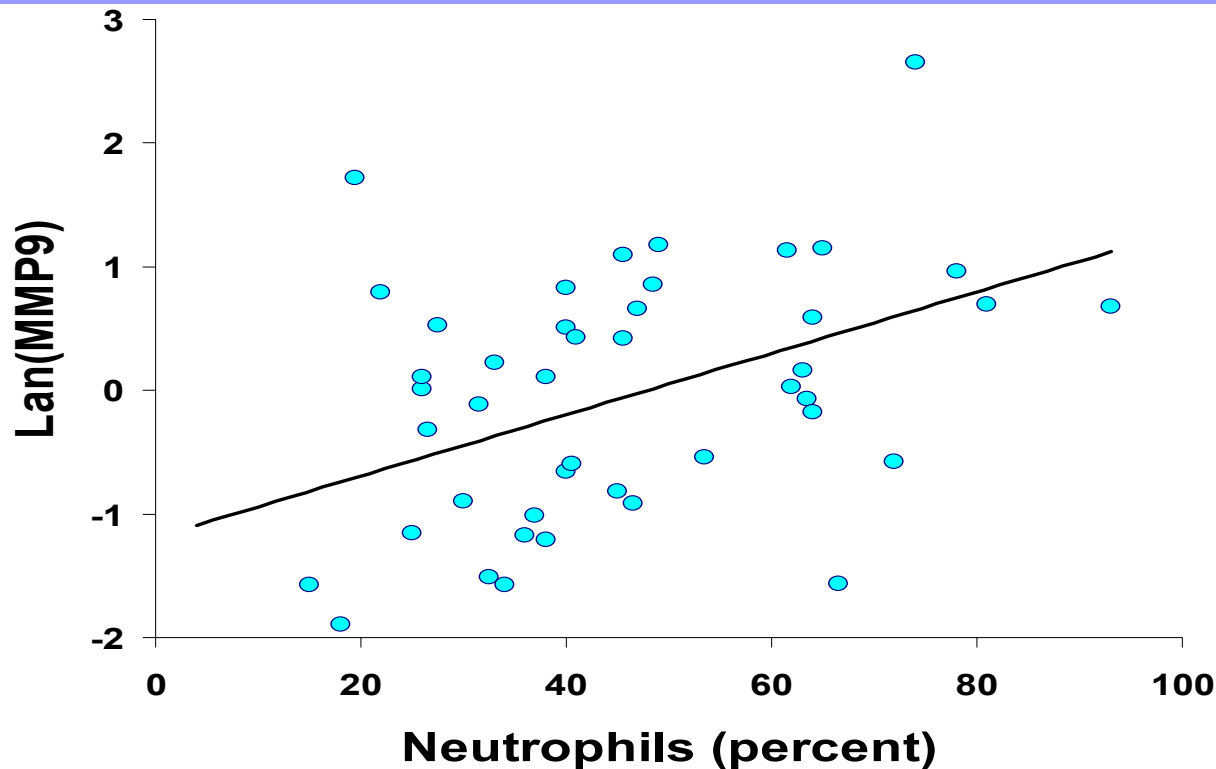
— NY Fire fighters — — - NY Dust



6/2002 – 10 months la

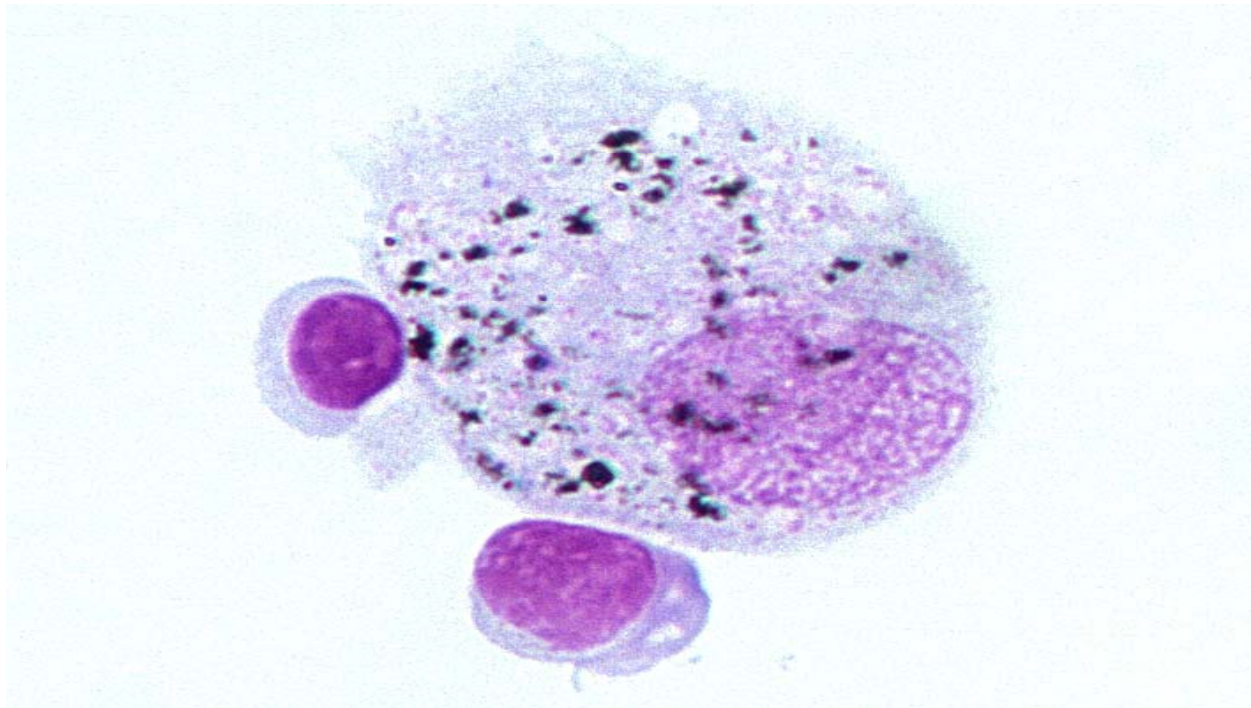
FDNY Firefighter Dust-Induced Inflammation Induced Sputum – 10 months later

Fireman, Prezant, etal. Environmental Health Perspectives: In Revisions



FDNY Firefighter Dust-Induced Inflammation Induced Sputum – 10 months later

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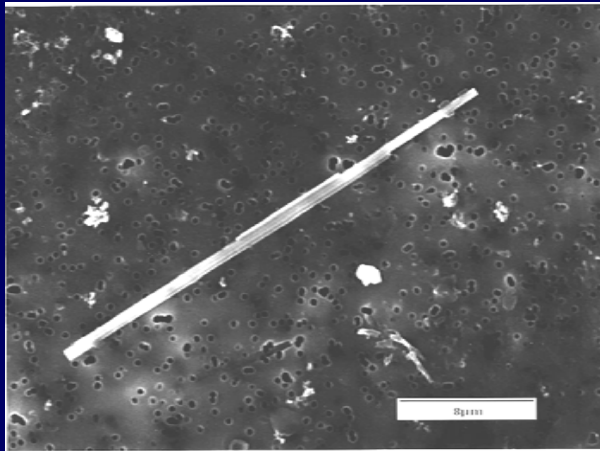


Light microscopic magnification X100

FDNY Firefighter with Pneumonitis

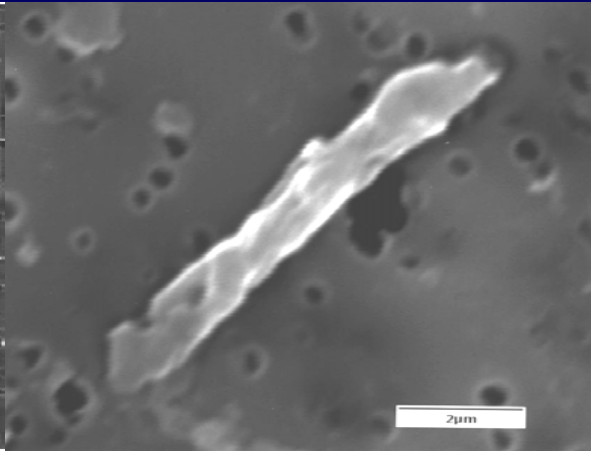
BAL Lavage Dust Particles

A



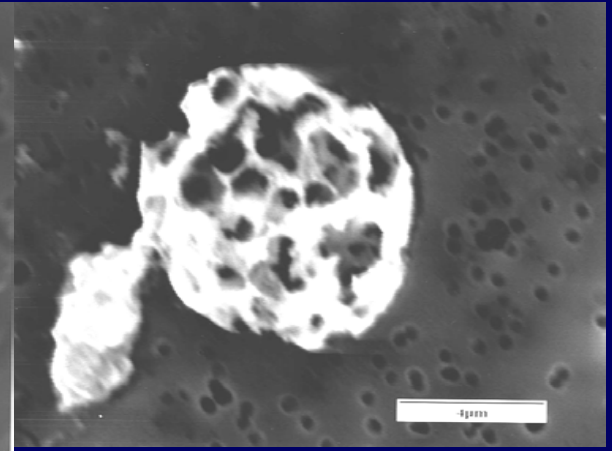
Uncoated asbestos fiber

B



Degraded fibrous glass

C

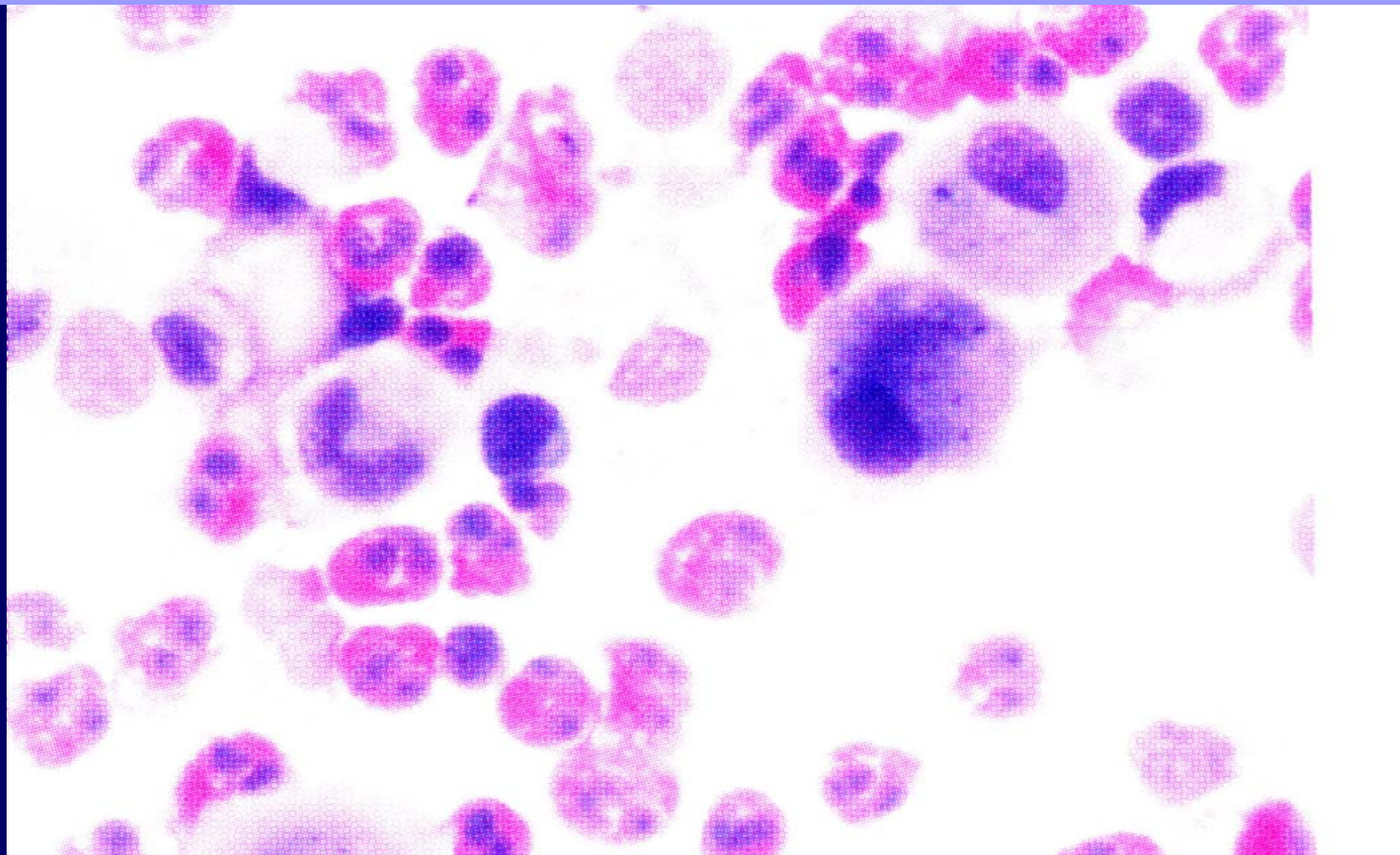


Fly ash particle

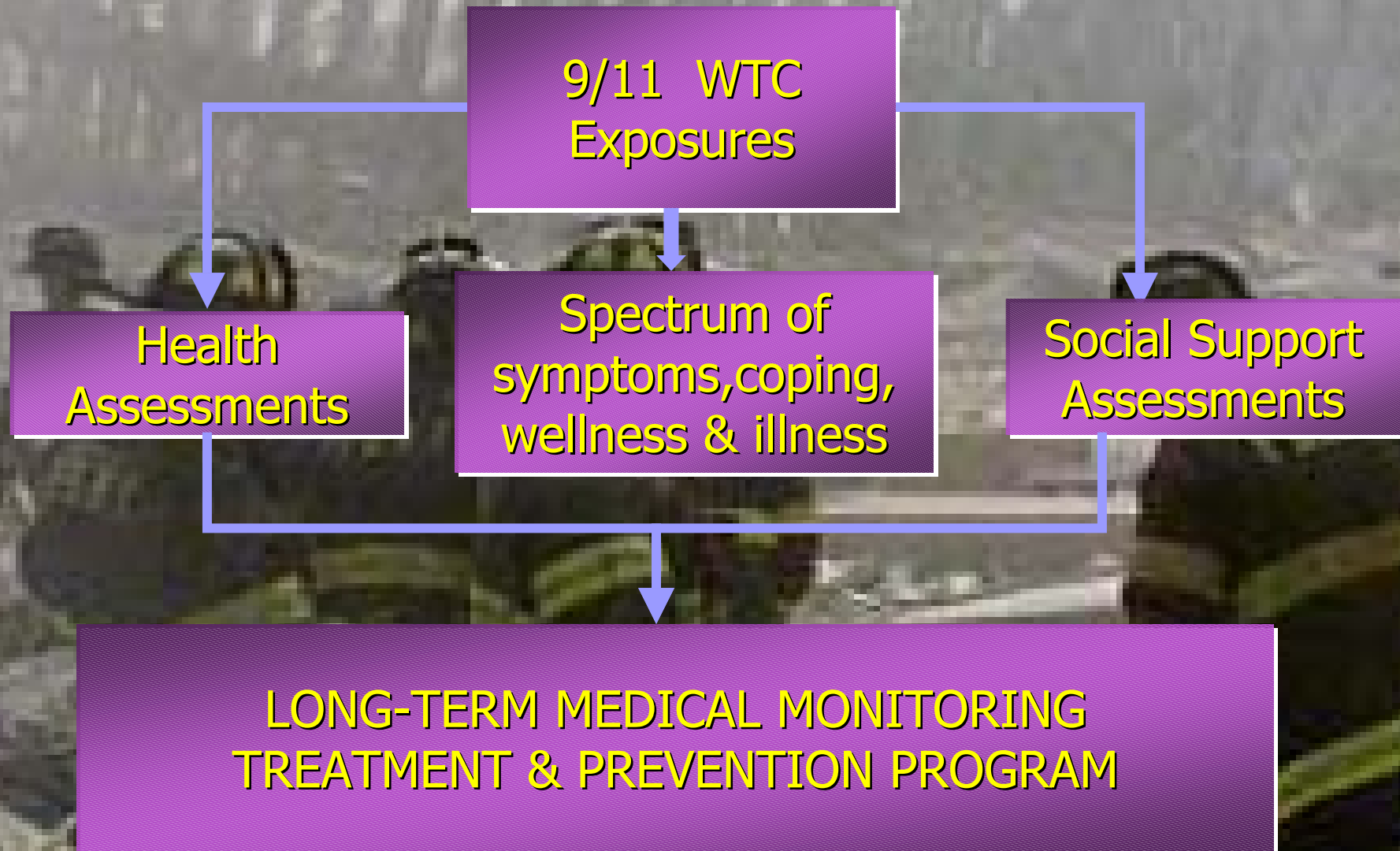
Rom, Weiden, Prezant, et al. Am J Resp Crit Care Med 2002, 166; 797

FDNY Firefighter with Eosinophilic Pneumonitis Dust-Induced Inflammation

BAL Findings



FDNY WTC Medical Monitoring Program





- **BASELINE AND FOLLOW-UP
WTC MEDICAL MONITORING IS ON-GOING**

- **WHAT HAVE WE LEARNED FROM A
SYNERGISTIC, COMPLEMENTARY
RESEARCH PROGRAM COUPLED TO THIS
MEDICAL MONITORING PROGRAM**

COMPONENTS OF FDNY WTC MEDICAL:

- **Questionnaires**
 - **Exposure, Medical & Stress**
- **Physician Evaluation**
- **PFT – Spirometry for everyone**
 - **Methacholine Challenge for selected groups**
- **Chest Radiographs for everyone**
 - **Chest CT for selected groups**
- **Bloods/Urine Bio-Monitoring**
- **ECG & Audiometry**



FDNY WTC MEDICALS

**October 2001 to March 02:
11,000 medicals done**

**FDNY:
Firefighters
Officers
EMS**



FDNY WTC MEDICALS

**Partnership with CDC
& NIOSH (n=400; October):**

Hydrocarbons

Antimony

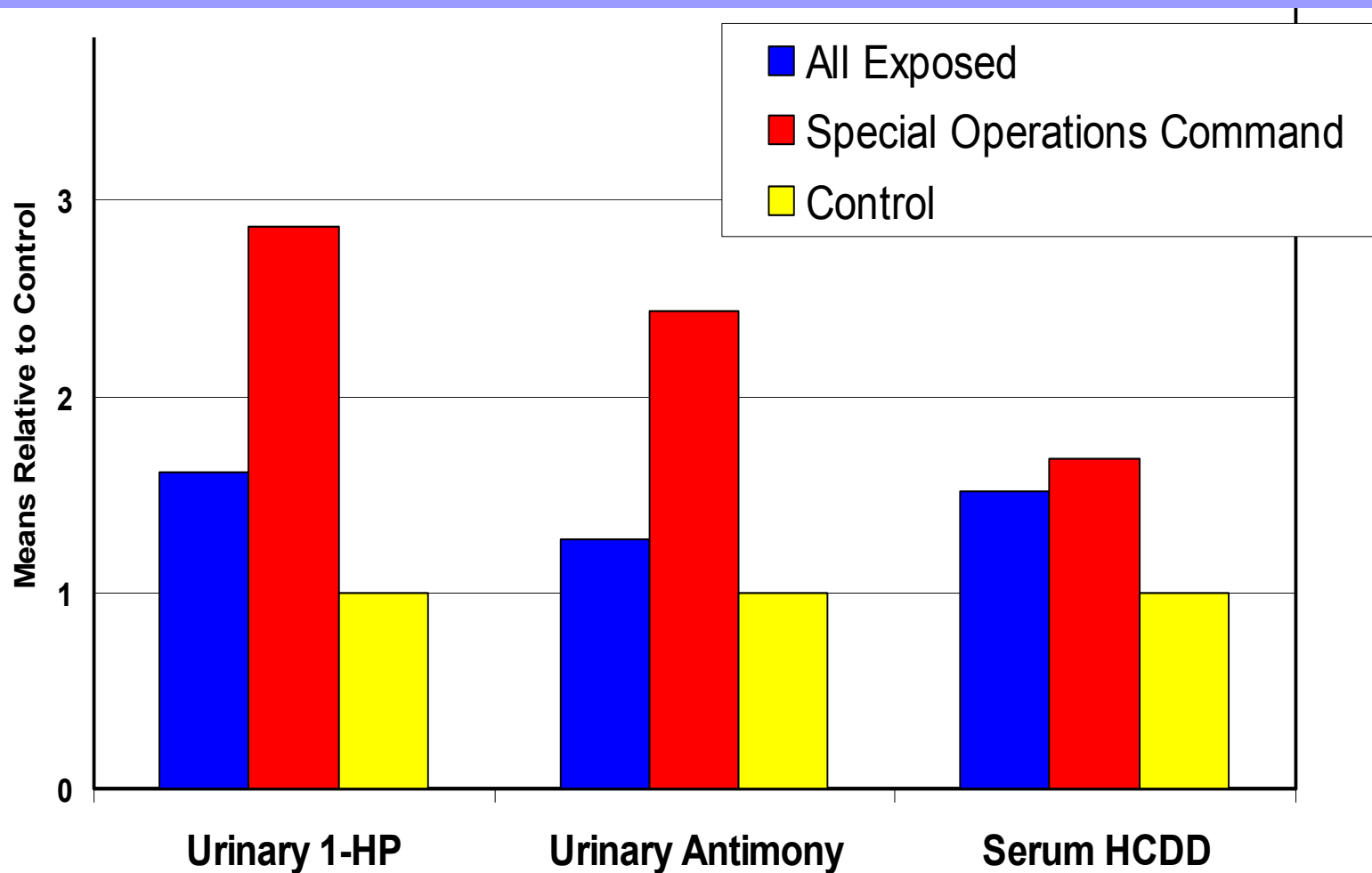
Dioxin & PCB Congeners

Slight Elevations in Above

- **None Clinically Elevated**
- **Most Normal compared to**
 - **FDNY FIREFIGHTER CONTROLS**



Bio-monitoring of FDNY at WTC



Edelman, Prezant et al, Environ. Health Perspectives Dec, 2003.

FDNY WTC MEDICALS

Total Serum PCBs

- Electrical Eqpt. & Food
- USA: 0 to 6 PPB = normal
- WTC
 - Avg < 6 PPB
 - 480 / 10,000 (5%) > 6 PPB
 - 36 > 12 PPB



FDNY WTC MEDICALS

Heavy Metals

– Serum Lead

- 25 mcg/dl
- 7 / 10,000 above limit

– Urine Mercury

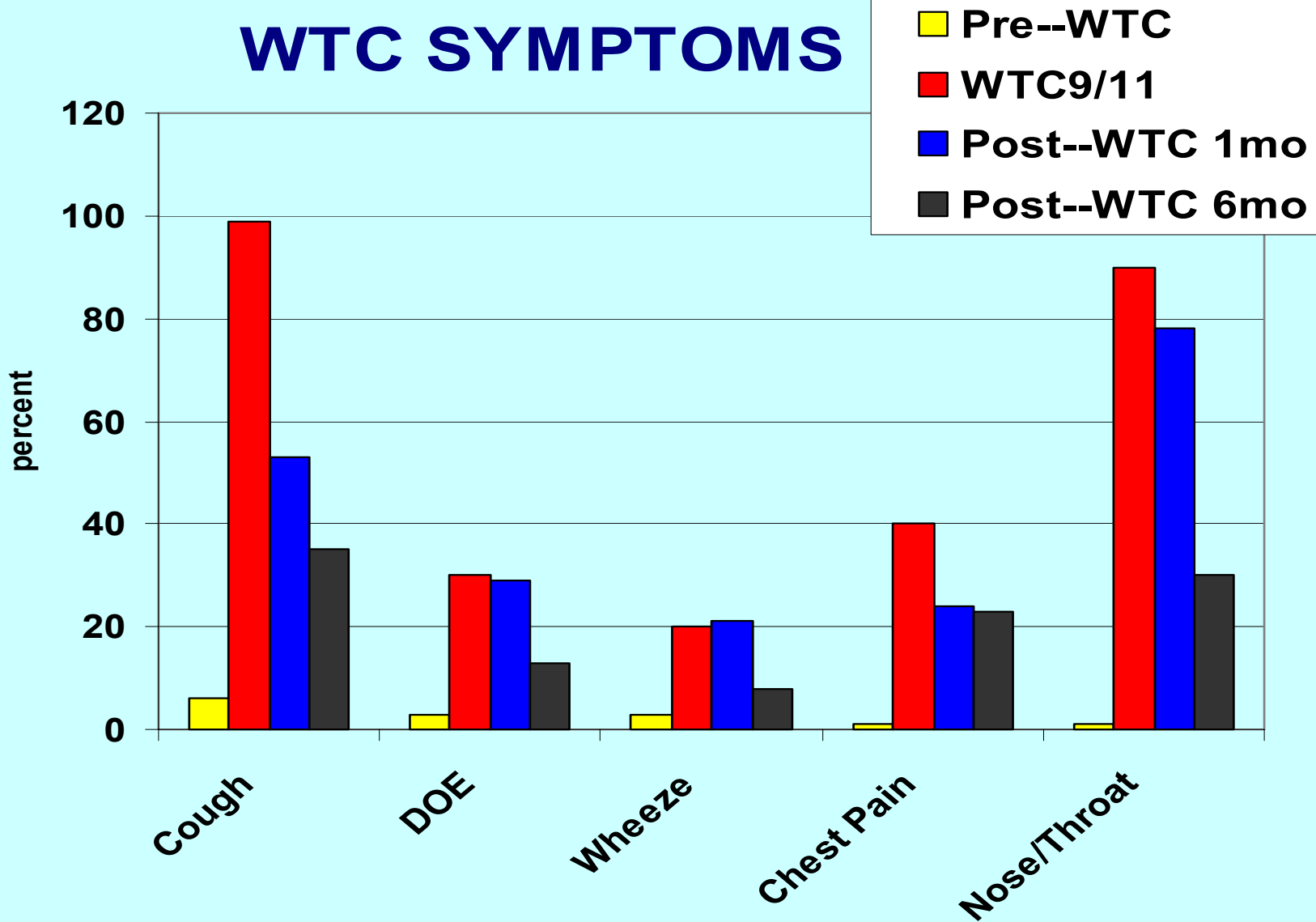
- 35 mcg/g creatinine
- 1 / 10,000 above limit

– Urine Beryllium

- 1 or 2 mcg /liter
- 1 / 10,000 above limit



WTC SYMPTOMS



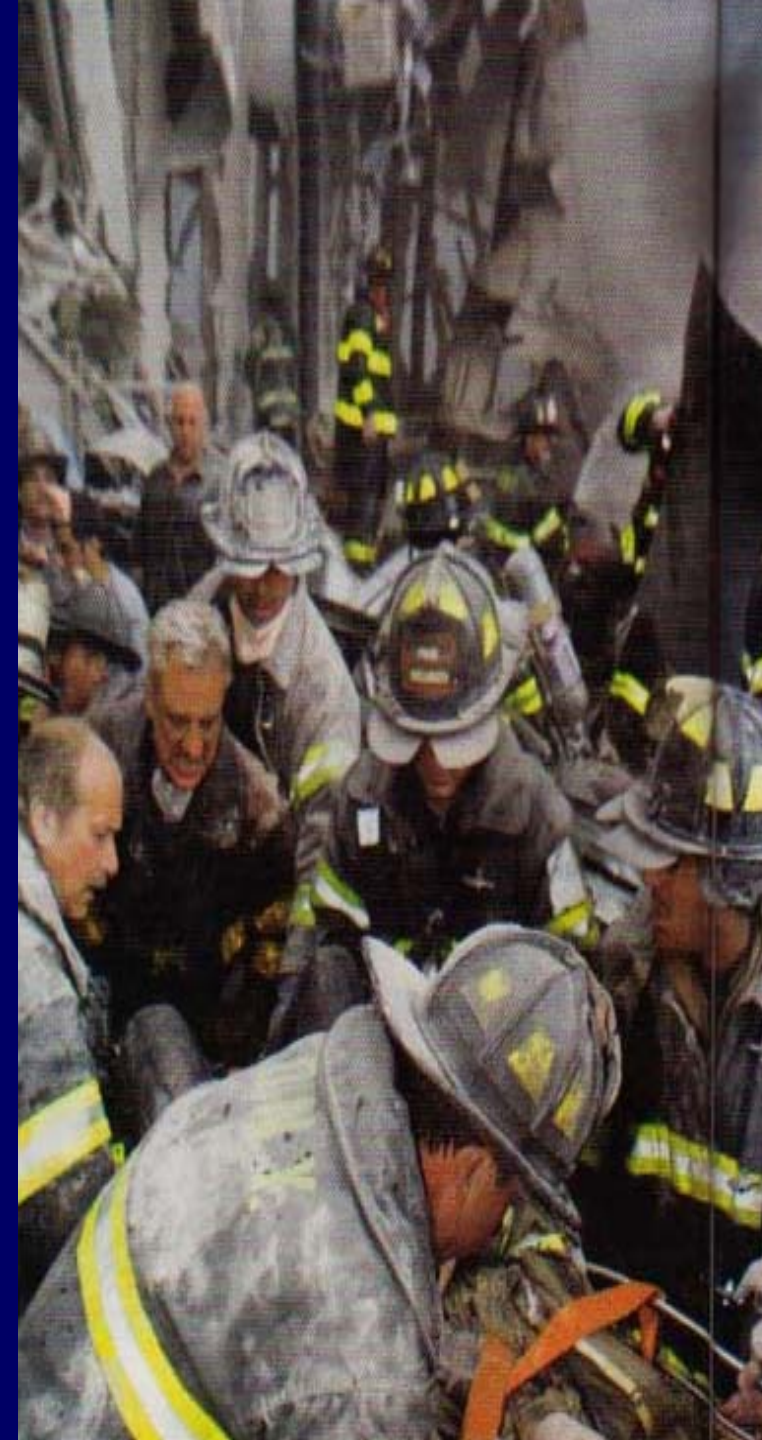
**This was a carefully selected healthy workforce pre-WTC
with new, persistent symptoms post-WTC**



FDNY WTC MEDICALS

Chest X-ray: PA view

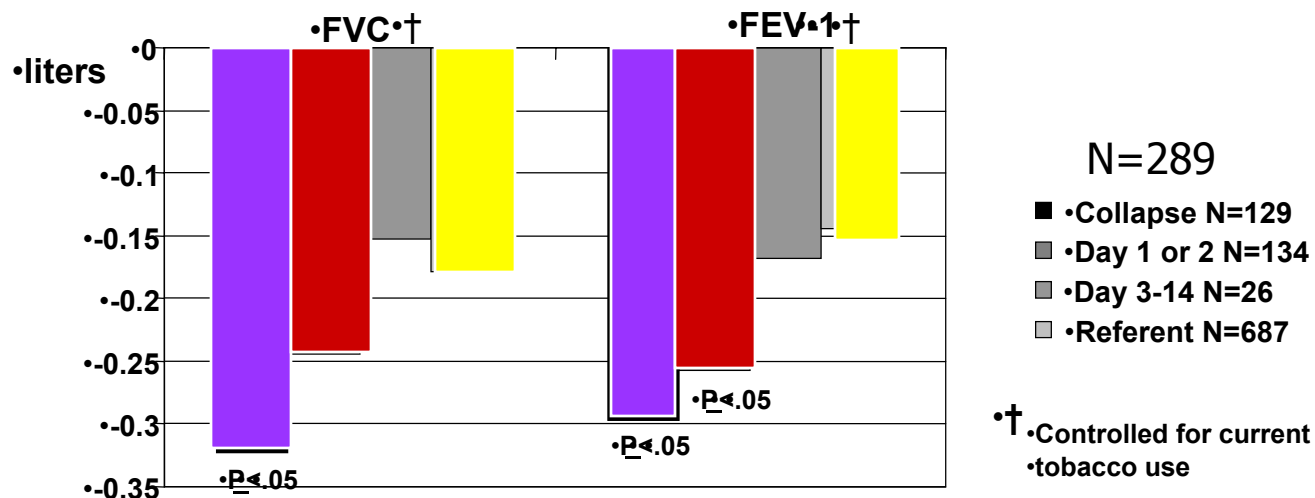
- Compared to pre-WTC Chest Films
 - Comparison to Baselines Reduce Unneeded Workups****
- Less than 30 of 9,000 were abnormal and these were in the symptomatic group**



FDNY PFT from MEDICALS

Pre-WTC vs. 1 month Post-WTC

- Figure 2: Mean change in FVC and FEV₁ post WTC
- exposure by exposure arrival group compared to annual
- change in referent group of NYC firefighters pre 9/11/01



Feldman, Bernard, Baron, Kelly, Prezant et al. Chest 2004

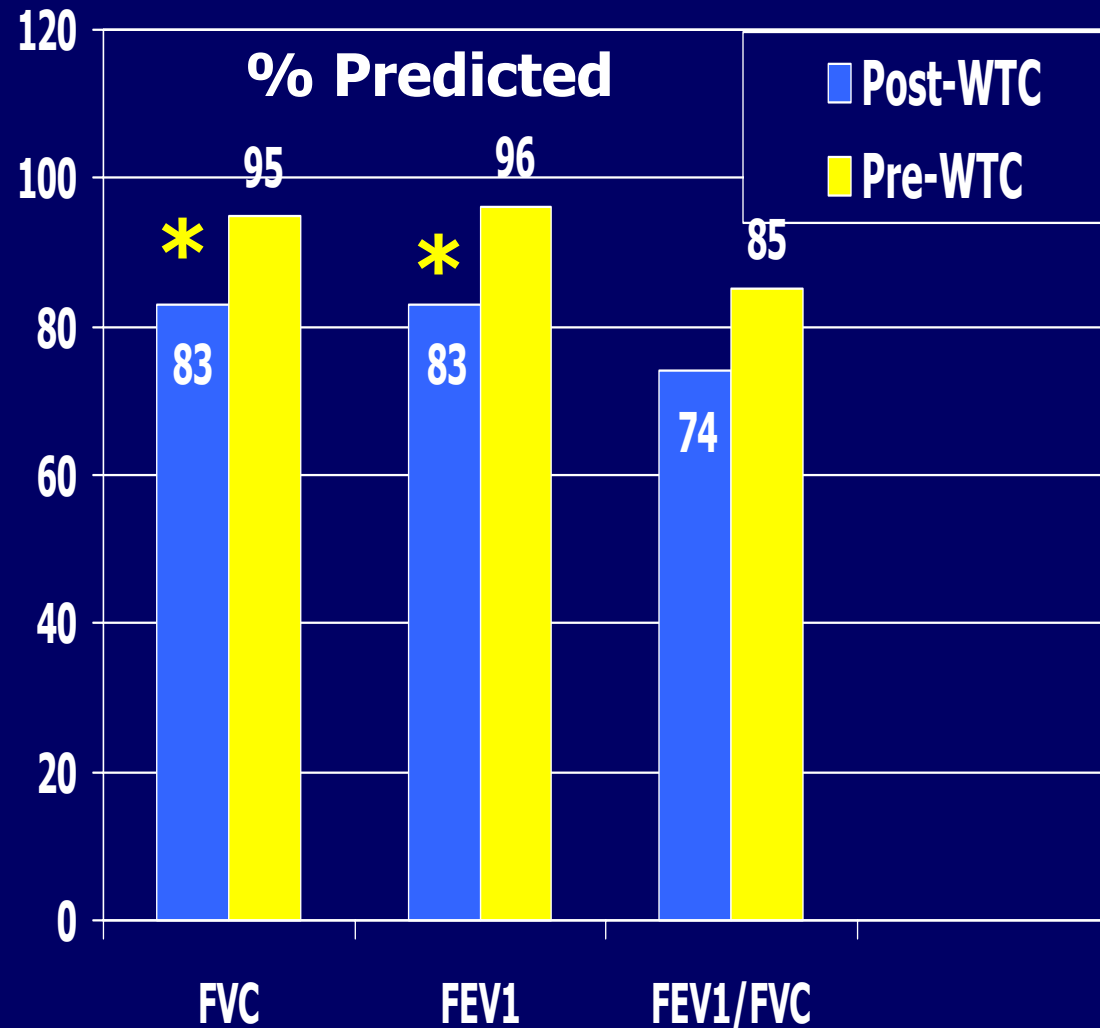
FDNY PFT from MEDICALS

Pre-WTC vs. Post-WTC

**Entire FDNY Cohort,
With or Without Symptoms,
Adjusted for Exposure**

**Post-WTC PFTs were at the
lower limits of normal**

**Would not have
appreciated the problem
without having Pre-WTC
PFTs for comparison**



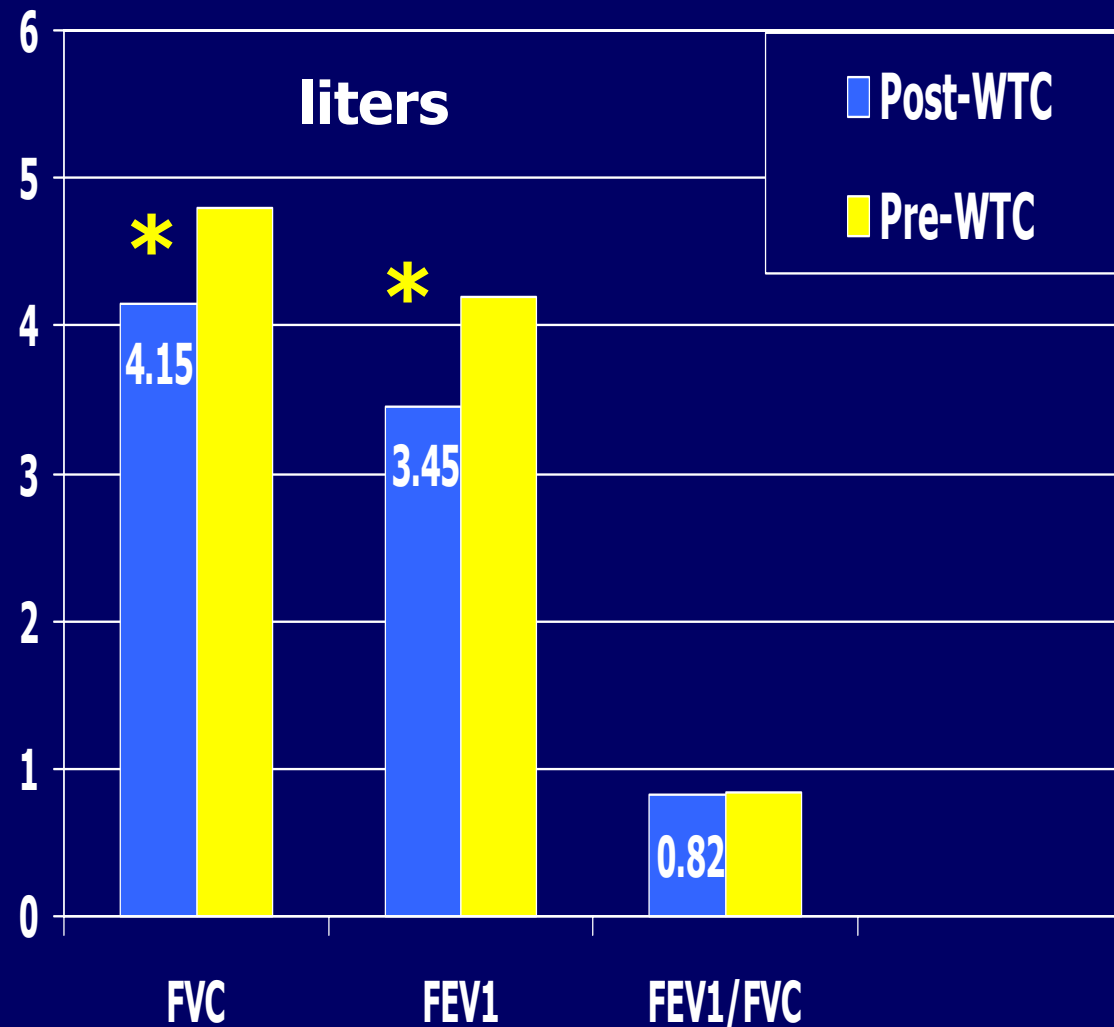
FDNY PFT from MEDICALS

Pre-WTC vs. Post-WTC

**Entire FDNY Cohort,
With or Without Symptoms,
Adjusted for Exposure**

**Average. Decline in
FVC and FEV1 was
300 to 500 ml**

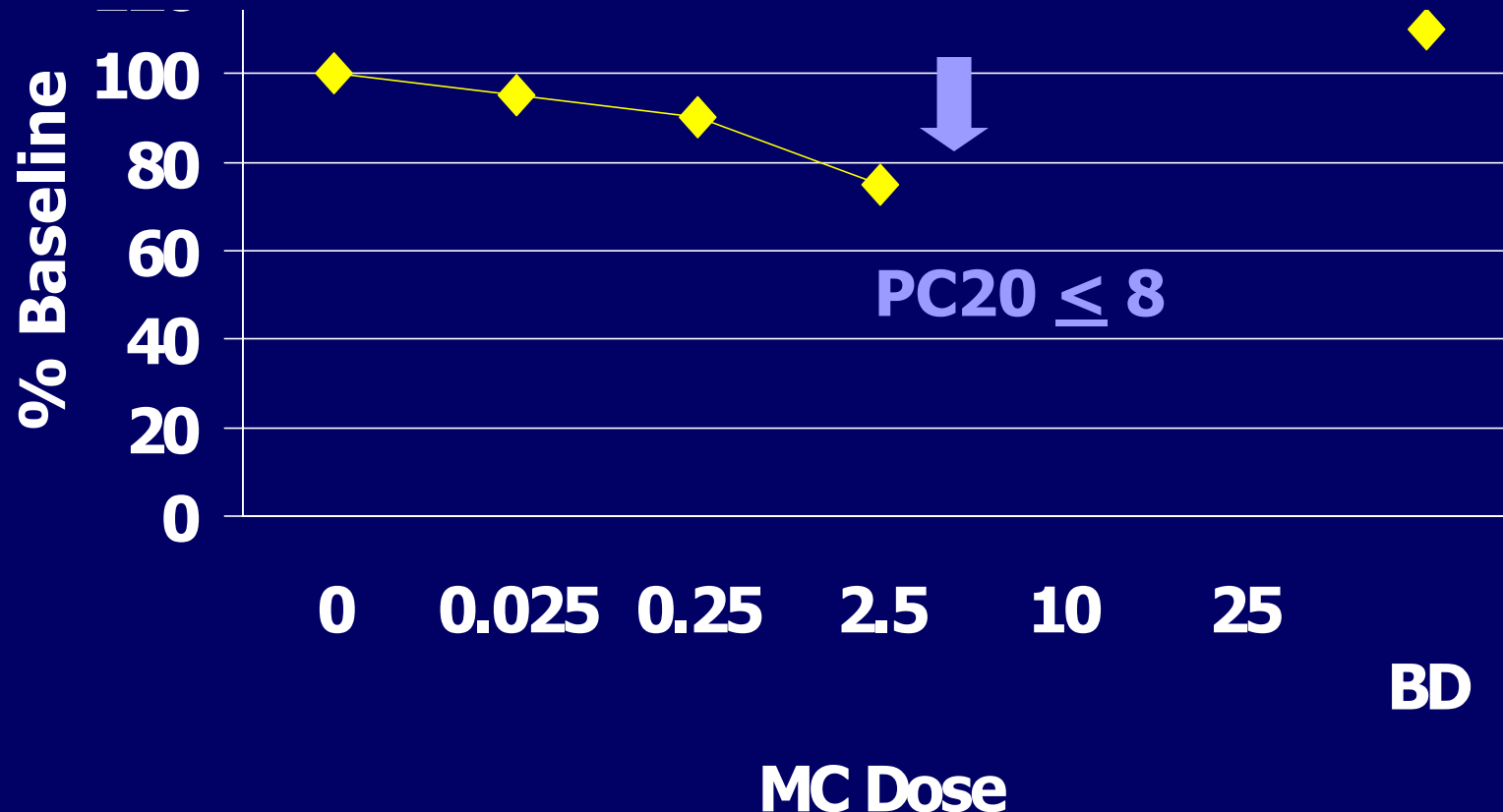
**Pseudo-restrictive with
normal Ratio due to
Air-trapping**



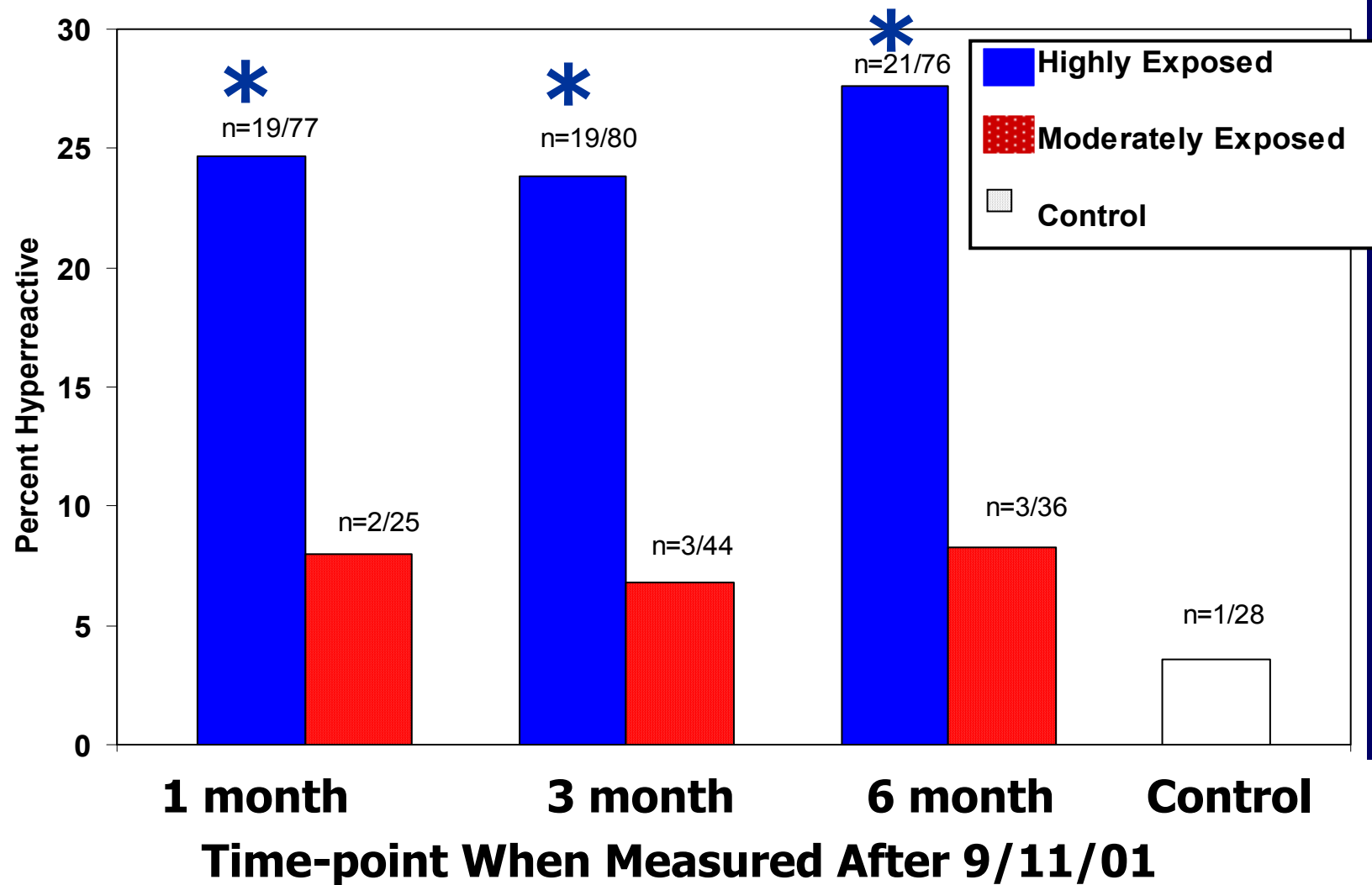
BRONCHIAL HYPERREACTIVITY

Methacholine Challenge Testing

Abnormal Result is a 20% or Greater Fall in Airflow
indicating Reactivity or Potential for an Asthma Attack

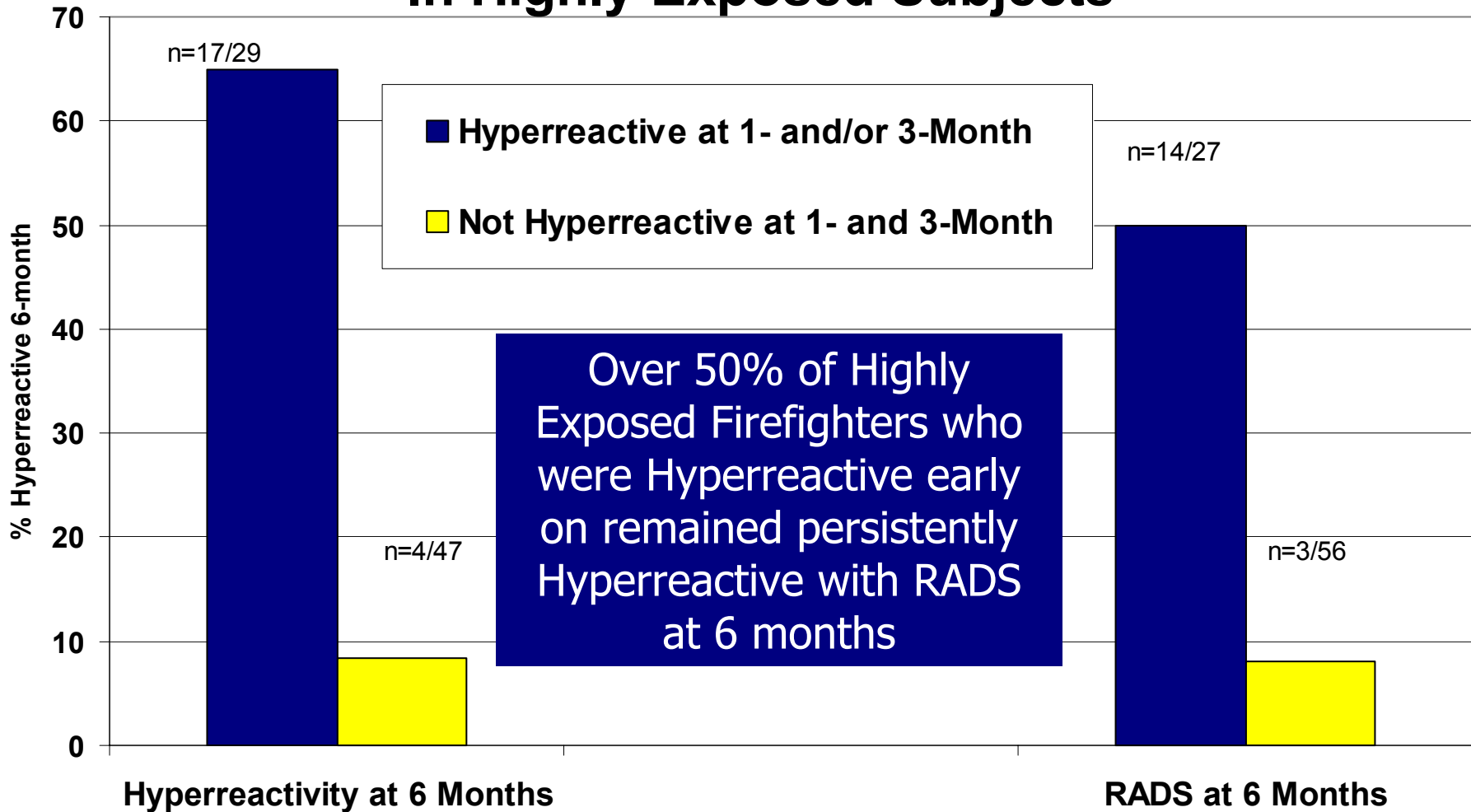


Hyperreactive Subjects PC20 < 8



Banauch, Kelly, Weiden, Prezant et al. ARRCM Sept. 2003

RADS and Hyperreactivity at 6 Months In Highly Exposed Subjects



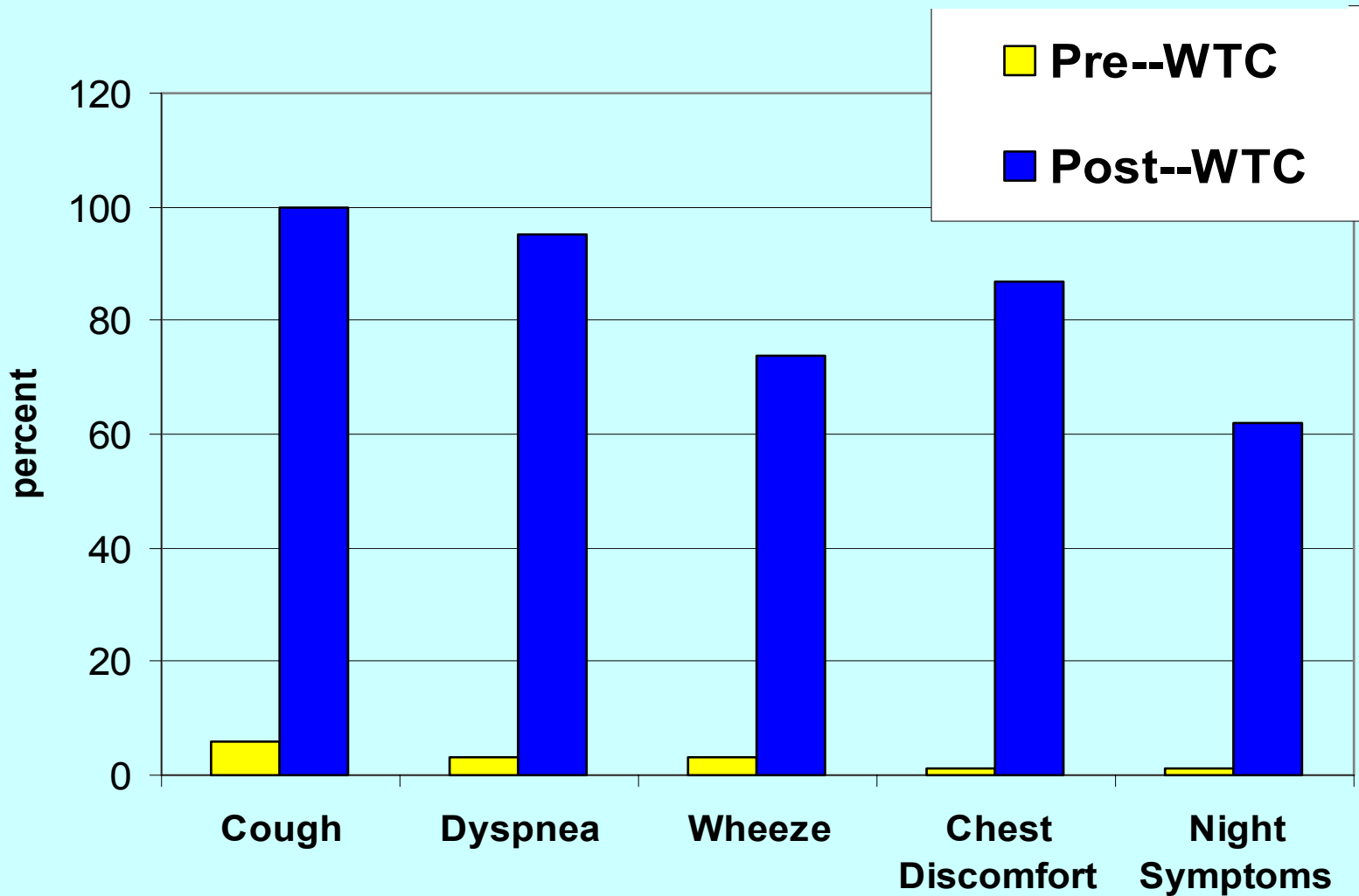
GROUND ZERO

Firefighters battle Trade Center cough

"WTC COUGH"

- The Most Symptomatic Required:
- Medical Leave ≥ 4 wk
- Over 1,500 needed major Rx
- Over 500 filed disability retirement
 - To date, over 320 awarded permanent disability

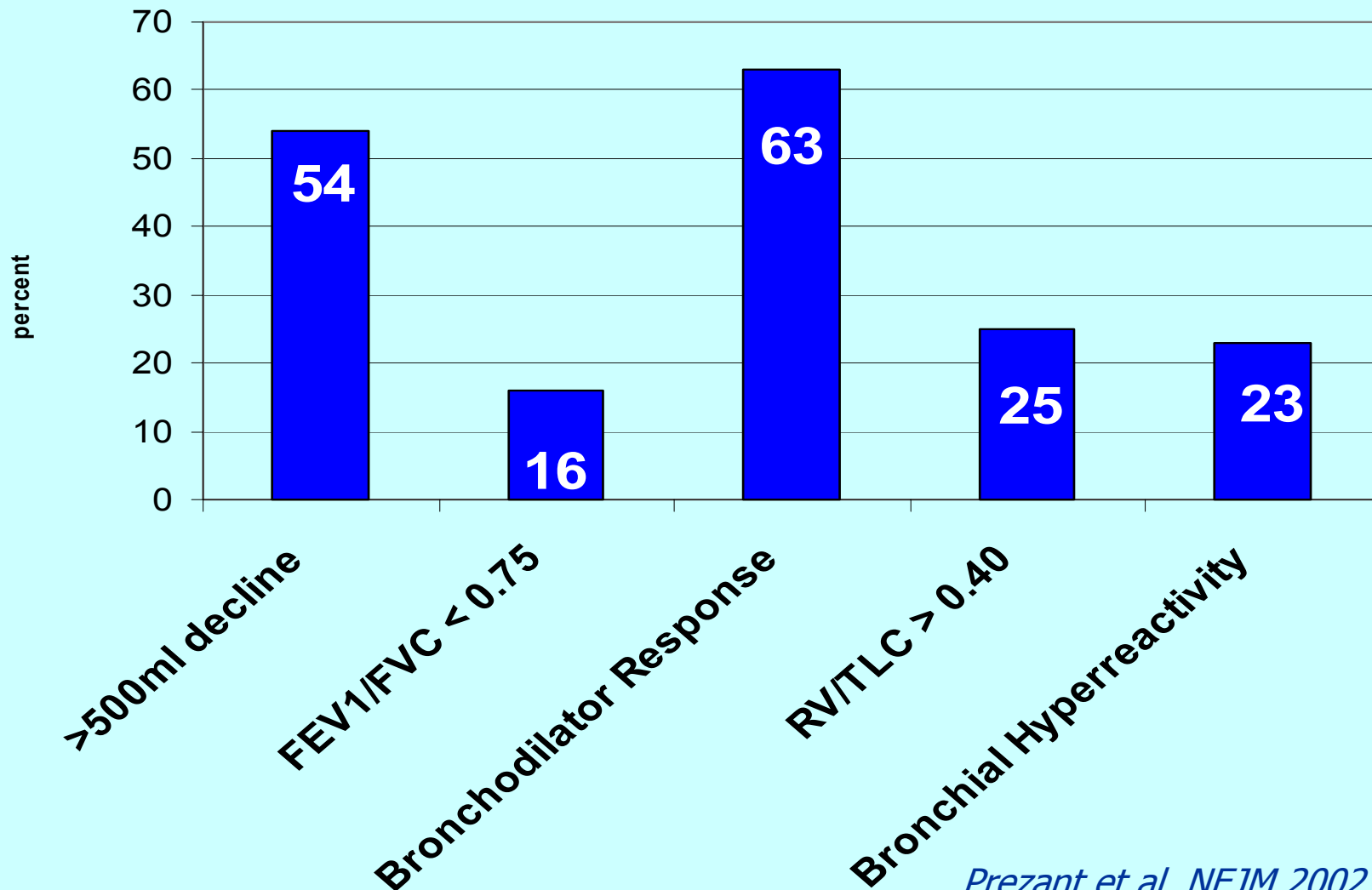
WTC COUGH PATIENTS - SYMPTOMS



Prezant et al. NEJM 2002



WTC COUGH PATIENTS - PFTS



Prezant et al. NEJM 2002

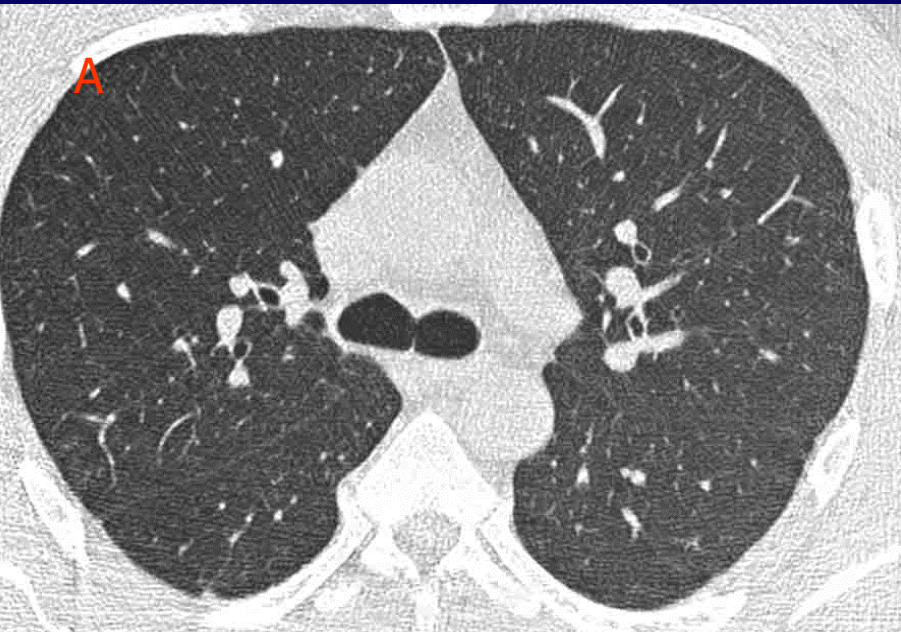


CHEST IMAGING IN “WTC COUGH PATIENTS”

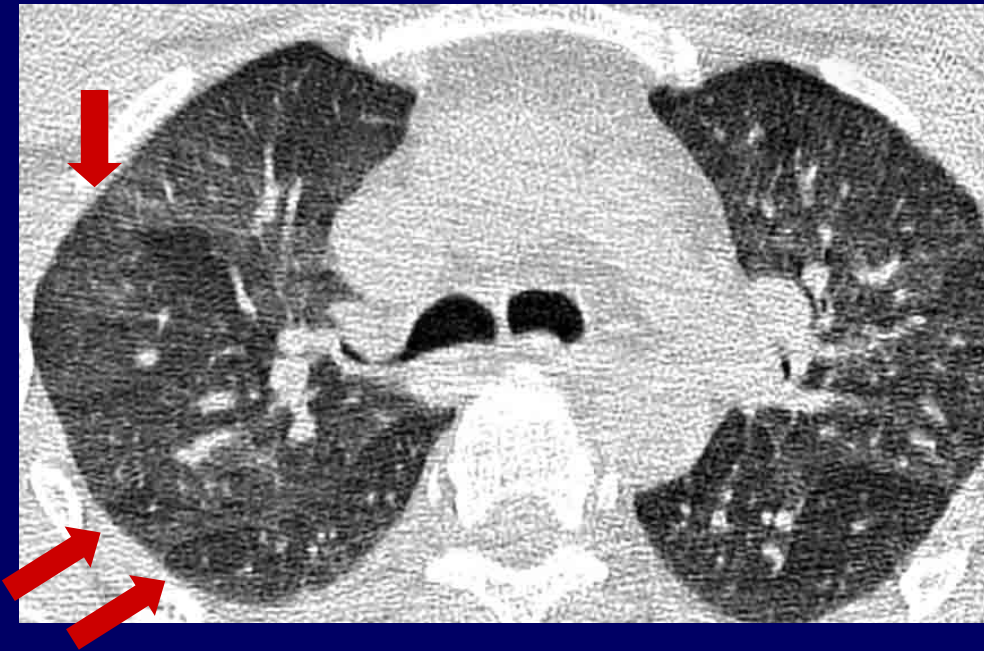
1. CHEST FILMS

- **NORMAL IN NEARLY ALL CASES**
- **CHEST CT SCANS (n=500)**
 - **Confirmed above chest film results**
 - **Normal Inspiratory Views**
 - **Expiratory Views Showed Airway Inflammation**
 - **Bronchial Wall Thickening, Air Trapping**

FDNY FIREFIGHTER WITH "WTC COUGH"



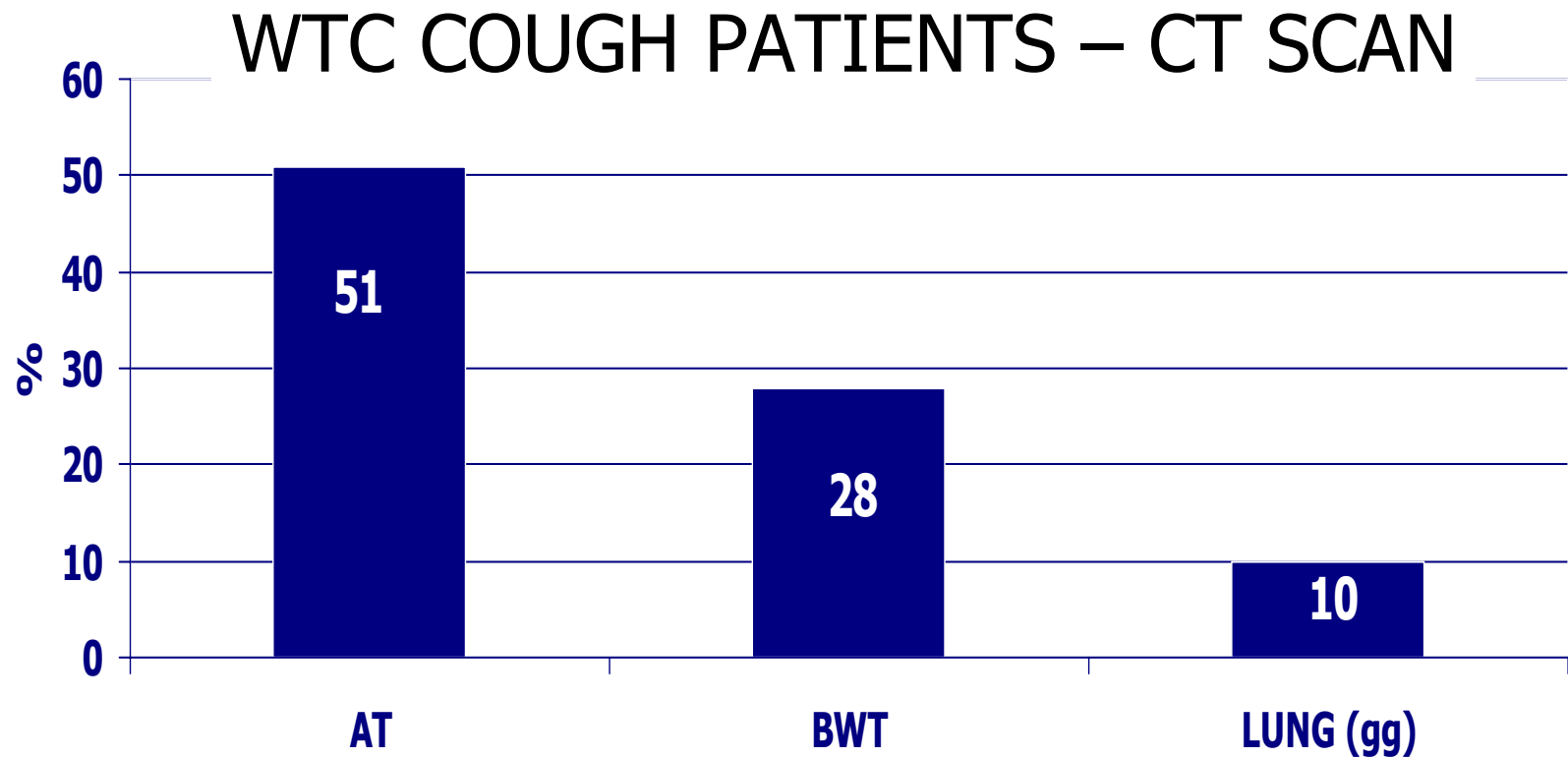
INSPIRATORY IMAGING



**EXPIRATORY IMAGING:
AIR TRAPPING**

McGinness, Prezant et al

High Resolution CT (Insp./Exp. Views)



Prezant et al. NEJM 2002



FDNY FIREFIGHTERS WITH PNEUMONITIS

Rare Findings in this 12,000 FDNY Cohort

- **2 with new onset Eosinophilic Pneumonitis completely reversed with treatment**
- **3 with new onset Progressive Pulmonary Fibrosis**
- **18 with new onset Sarcoidosis**
 - **A 3 to 5 fold increased incidence rate for FDNY**
 - **All stable, some resolved**

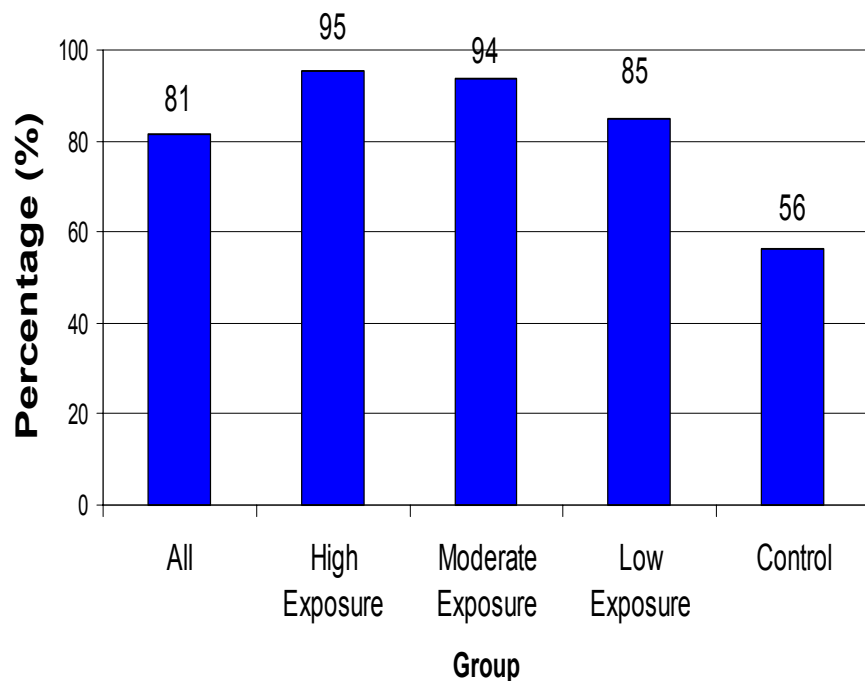
- 
- **COUGH, SINUS CONGESTION, ACID REFLUX**
 - **EXERTIONAL SHORTNESS OF BREATH**

WTC DUST CAUSED

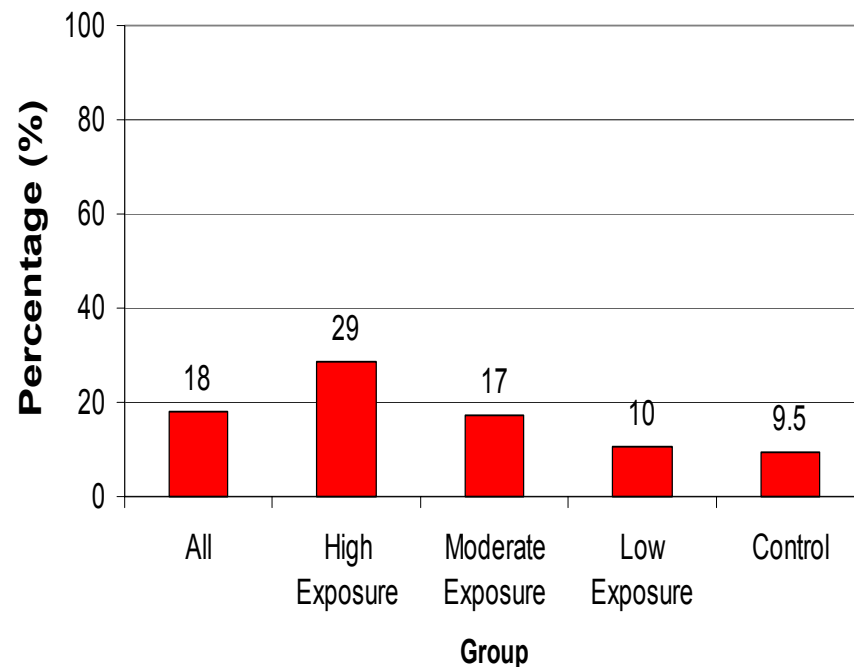
- **REDUCTIONS IN PULMONARY FUNCTION**
- **AIRWAYS INFLAMMATION**
- **Many Cases of ASTHMA or RADS**
- **Rare Cases of Pneumonitis**
- **Major Health Concerns**

FDNY HEALTH CONCERNS

**Persons Who Worried About Their Health
By Exposure Group (0-1 yr exam)**



**Persons Who Feel Their Future May Be Cut Short
By Exposure Groups (1-2 yr exam)**



FDNY WTC Research Priorities:

9/11 WTC
Exposures

```
graph TD; A[9/11 WTC Exposures] --> B[LONG-TERM MEDICAL MONITORING PROGRAM]; B --> C[Mental Health]; B --> D[Respiratory]; B --> E[Late Emerging Diseases ?? (ex. Cancer)];
```

The diagram is a flowchart with a background image of firefighters. At the top is a purple box labeled '9/11 WTC Exposures'. Three blue arrows point from this box to a larger purple box in the middle labeled 'LONG-TERM MEDICAL MONITORING PROGRAM'. From this middle box, three blue arrows point down to three separate purple boxes at the bottom: 'Mental Health', 'Respiratory', and 'Late Emerging Diseases ?? (ex. Cancer)'.

LONG-TERM MEDICAL MONITORING PROGRAM

Mental Health

Respiratory

Late Emerging
Diseases ??
(ex. Cancer)